MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2016/2017

EME4196 – QUALITY ENGINEERING

(ME / RE / BE)

18 OCTOBER 2016
9.00 a.m – 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of four printed pages (including cover page) with four questions.

2. Attempt **ALL FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is shown.

3. Please write all your answers in the Answer Booklet provided.

4. All necessary workings MUST be shown when applicable.

Question 1 (25 marks)

a) A cellphone company that prides itself in providing high-performance phones at very competitive prices has developed a new cellphone model for the Asia market. As a customer, select and explain six out of nine dimensions of quality that you think a cellphone should excel in. [12 marks]

b) The following information were given by an integrated circuit (IC) chip manufacturing semiconductor company:

- The manufacturing process yields 99.90% acceptance product at the outgoing testing station.
- 100% manual inspection is needed for code marking on each IC.
- Shortage of manpower for manual inspection and rework on rejected items
- High overtime by employees led to high overhead cost.
- Limited space in the production floor

The top management of the company is concerned about the customer complaint of high failure rate and low profitability of the IC products. As the project manager of this product line, write a proposal to the top management to recommend that the Lean Six Sigma Approach is perfectly suitable to be used for solving the performance problems and making improvements of the product. Your proposal should cover the definitions of Lean Six Sigma Approach with at least six out of eight Lean Fundamentals and the nucleus of Six Sigma methodology DMAIC.

[13 marks]

Continued...

Question 2 (25 marks)

a) A quality control supervisor of a company that manufactures slip rings has taken three samples with four observations on the diameter of the slip ring in centimeter (cm). If the standard deviation of the slip ring is 0.05 cm, use the data in Table Q2 i) and Table Q2 ii) to compute the $\overline{X}$ and R chart central line and control limits.

[15 marks]

Table Q2 i)

Sample	Slip Ring Diameter (cm)			
	1	2	3	4
1	5.02	4.94	4.99	4.96
2	4.96	5.03	4.89	4.99
3	5.03	4.91	5.01	5.05

Table Q2 ii)

n	Factor for $\overline{X}$ chart	Factors for R chart	
	A_2	D_3	D_4
2	1.88	0.00	3.27
3	1.02	0.00	2.57
4	0.73	0.00	2.28
5	0.58	0.00	2.11
6	0.48	0.00	2.00
7	0.42	0.08	1.92
8	0.37	0.14	1.86

b) From the answers obtained in 2 a), decide if the manufacturing process for slip ring is considered to be in a state of control or out of control. Justify your answer.

[6 marks]

c) A lot or batch of items can be inspected in several ways including the use of single and double sampling. Explain the difference between single and double sampling.

[4 marks]

Continued...

Question 3 (25 marks)

a) Elaborate clearly the four factors associated with reliability by its definition. [4 marks]

b) "Rolling element bearing life is determined by its load, temperature, maintenance, lubrication, material defects, contamination, handling, installation and other factors. There are three usual limits to the lifetime or load capacity of a bearing namely abrasion, fatigue and pressure-induced welding"
Based on the above statement, assume that you are a top management manager of a bearing manufacturing company, make recommendations on how to improve the four important aspects of bearing reliability. [6 marks]

c) Find the reliability of the system below where components 1, 2, 3, 4, 5, and 6 have reliabilities of 0.900, 0.956, 0.982, 0.999, 0.953 and 0.953 respectively if
i) They are connected in series. [2 marks]
ii) They are connected as shown in Figure 1 below. [3 marks]
iii) Comment on the design aspect on reliability for a system with many components. [2 marks]

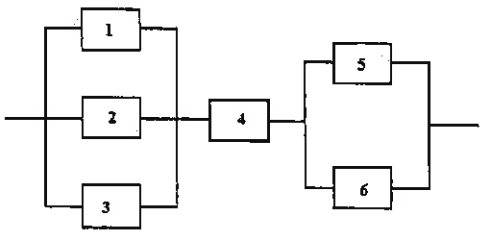

Figure 1

d) i) What is the objective of applying the Failure Mode and Effect Analysis (FMEA) technique as a total quality tool? [2 marks]
ii) Discuss any six of the nine-steps process used in FMEA. [6 marks]

Question 4 (25 marks)

a) The employees of your company are reluctant to commit to the Total Quality Management (TQM) effort that you would like to implement. As the Quality Manager in the company, one of your administrative function is to make the employees understand the need of TQM. Make a proposal that includes the needs and at least 8 aids and motivation to promote TQM concept to the employees. [10 marks]

b) i) Provide at least three important reasons why management should go for a computerized Quality Control System. [3 marks]
ii) Explain the six quality function needs that can be served by computers. Elaborate on each need. [12 marks]

End of Page